93-253

Reason
Foundation

3415
S. Sepulveda Blvd.
Suite 400
Los Angeles
CA 90034
(310) 391-2245

No. 135
November 1991

REFORM OF SPECTRUM MANAGEMENT: LESSONS FROM NEW ZEALAND

Milton Mueller,
International Center for Telecommunications Management
University of Nebraska at Omaha

EXECUTIVE SUMMARY

The radio frequency spectrum is one of the critical resources of the information age. Some of the most powerful new communications and computing technologies--cellular telephones, wireless computers, global paging--harness the radio spectrum to achieve mobility and ubiquity. In this dynamic context the allocation of the spectrum resource--who gets which frequencies for which uses--is an increasingly important factor in the development and introduction of new communications technologies. As applications multiply, competition for space on the radio spectrum is intensifying, imposing increased demands on our system of managing the spectrum.

In 1989, New Zealand completely reshaped its spectrum-management regime, privatizing large parts of the radio spectrum and utilizing auctions to distribute spectrum rights. Its experiment offers concrete experience of how similar reforms might improve U.S. spectrum allocation and management.

New Zealand's 1989 law made two key changes in the traditional spectrum management regime. One was the use of auctions rather than hearings or tribunals as the method of assigning radio licenses. The other was the privatization of spectrum rights through the creation and distribution of long-term, tradable property rights in radio bands.

The results of the two experiments have significantly different implications for the future of spectrum management in the United States. Auctioning licenses has been the most successful and least problematic aspect of the New Zealand experiment. Under the auction process: 1) applicants were able to enter desired telecommunications markets expeditiously; 2) smaller applicants were not excluded; 3) some tenders successfully rationed between competing uses as well as users; 4) the value of the spectrum in various locations and applications was revealed; 5) the government received a significant amount of revenue for the spectrum.

Auctioning was an expeditious way of resolving competition for assignments. In a year and a half, New Zealand's Ministry of Commerce received a total of 2,915

Note: Nothing written here is to be construed as necessarily reflecting the views of the Reason Foundation or as an attempt to aid or hinder the passage of any bill before any legislative body.

bids for 264 contested licenses in 5 different bands, an average of 11 bids per license. Altogether, it released 448 MHz of the spectrum in that time.

This contrasts with U.S. attempts to assign licenses to unused channels. Both the FCC's low-power television and cellular telephone proceedings were overwhelmed by the large number of applicants. The glut of applicants led to long delays in the use of the bands as the FCC attempted to use arbitrary or time-consuming methods such as lotteries or comparative hearings to resolve the competing claims. The auctioning method allowed New Zealand to avoid such overloads of the assignment system.

An auctions system would tend to work even better in the United States than in New Zealand because of the far larger number of bidders in the market. The net effect of spectrum auctions would likely *increase* the access of smaller organizations to the airwaves relative to bureaucratic allocation systems.

Two conclusions can be drawn about the prospects for the second type of reform in New Zealand spectrum privatization. First, private property rights to the spectrum are technically feasible; the biggest problems encountered in implementing them in New Zealand have been political and institutional. Second, spectrum privatization can be achieved more easily and efficiently by creating and distributing nationwide rights to a broad spectrum of frequencies (management rights) than by privatizing individual, localized channels.

With respect to privatizing the spectrum, the situation in the United States is far more complicated than in New Zealand. The importance of incumbent users in the United States means that the goal of privatization would have to be pursued in different ways. One possibility is that the FCC could continue to expand the technical and economic flexibility of existing licensees, gradually transforming the license into a private property right. Another possibility is that the Congress might try to privatize the FCC instead of the spectrum per se. That is, its spectrum management functions could be turned over to private, commercial, independent, and competing "frequency-planning organizations" with management rights over large tracts of the spectrum. During the transition, incumbent license holders could be grandfathered for the duration of their FCC licenses, after which they would have to bid for them.

Though the United States cannot directly emulate the New Zealand spectrum-privatization model, New Zealand's experience demonstrates that privatization and a private-property -based market for radio frequencies is feasible and can more efficiently allocate spectrum than the current bureaucratic system.

I. Introduction

The radio frequency spectrum is one of the critical resources of the information age. Some of the most powerful new communications and computing technologies harness the radio spectrum to achieve mobility and ubiquity. Cellular telephones, wireless computers, wireless LANs and global paging are only a few samples of the new applications of radio communication.

In this dynamic context the allocation of the spectrum resource--who gets which frequencies for which uses--is an increasingly important factor in the development and introduction of new communications technologies. As applications multiply, competition for space on the radio spectrum grows ever more intense. This has imposed unprecedented demands on our system of managing the spectrum.

This report examines a radical experiment in radio spectrum management. Two years ago, New Zealand completely reshaped its spectrum management regime, privatizing large parts of the radio spectrum and utilizing auctions to distribute spectrum rights. In the future, market transactions among radio band owners will play a major role in allocating New Zealand's spectrum resource. New Zealand is the first country in the world to turn away from centralized government management of the spectrum, and rely instead on market forces.

The U.S. Policy Stalemate

New Zealand's experiment has relevance for other countries, particularly the United States. For the past six years, U.S. spectrum management policy has been stuck in an unproductive political stalemate. On one side are the advocates of "greater reliance on market principles in distributing spectrum."[1] In their view, market rationing will be faster and more efficient than government allocation and will give users the proper incentives to use the spectrum wisely.

The call for market principles in spectrum management, however, runs counter to the nation's basic law governing spectrum allocation, the Communications Act of 1934. The Communications Act declares that the radio spectrum is a "public resource." The Act is interpreted to forbid auctions, private ownership of radio frequencies, and many other prerequisites of a market economy. Supporters of the traditionalist approach to spectrum management oppose use of market principles in spectrum allocation. This camp includes some long-established industry users of spectrum, such as broadcasters and land mobile radio users, the majority of Congress, and some consumer groups.

Ironically, the strongest advocates of market-based reform are precisely those agencies the Communications Act has charged with the responsibility for managing and distributing spectrum. The Federal Communications Commission (FCC) is

responsible for allocating and assigning radio channels to the private sector. The National Telecommunications and Information Administration (NTIA) is responsible for managing the federal government's spectrum. Both have become persistent advocates of market reform. One reason is that the FCC's attempts to hand out frequencies for free, via administrative mechanisms such as lotteries, repeatedly lead to tidal waves of applications, creating processing burdens far beyond the Commission's capabilities.[2]

These kinds of pressures have prompted the Commission and the NTIA to experiment with new methods of assignment and allocation insofar as is possible within the limits of the Communications Act.[3] Small, incremental reforms have been enacted in a variety of areas, and many proposals have been circulated. Political opposition, however, has repeatedly blocked attempts to change the Communications Act in ways that would make market reform possible. Reaction against market proposals has been entirely negative: no alternative methods of dealing with the intensifying competition for spectrum have been proposed.[4] Thus, while most policy analysts, scholars, and regulators have become convinced of the need to introduce market forces into spectrum management, political and industry opposition stands in the way of the necessary legal changes. The result is a stifling policy gridlock.

Fear of the unknown accounts for much of the opposition to market reform of spectrum allocation. Opponents argue that spectrum market proposals have never been tried, that they are untested "theories." Some argue that buying and selling the spectrum is not possible; others believe that the results would be disastrous from the standpoint of social policy. Established users fear that their interests would be harmed in the transition; others claim that a market for spectrum would exclude small users and start-up companies from access to the spectrum resource.

New Zealand: A Breakthrough in Spectrum Reform

If the United States is to break out of its spectrum policy impasse, the catalyst must come from real-world experience rather than ideology or theory. Abstract arguments regarding market-based spectrum management, pro and con, have been reiterated many times. Fortunately, market reform of spectrum management is no longer just a theoretical idea. New Zealand's experiment can offer concrete experience of the results. Its market reforms have been in existence for a year and a half.

This report is intended to be an objective, nonpartisan assessment of the political, technical, and economic problems encountered during the transition to market-based spectrum management. It is the first independent assessment of the results of New Zealand's experiment.[5]

The report is divided into five parts. Part II contains the historical background and a description of New Zealand's new Radiocommunications Act. The law made two

distinct changes in the traditional spectrum management regime. One was the use of auctions rather than hearings or tribunals as the method of assigning radio licenses. The other was the privatization of spectrum rights through the creation and distribution of long-term, tradable property rights in radio bands. These two aspects of the law are evaluated separately. Part III evaluates auctions as a method of assigning frequencies. Part IV evaluates the spectrum privatization aspect of the law. The final section summarizes the results and attempts to apply what can be learned from the New Zealand experience to the U.S. situation.

II. New Zealand's New Radiocommunications Act

Radical reform of spectrum management was only one part of a broader re-orientation of New Zealand's economic policy. From 1984 to 1989, the fourth Labour government instituted a period of rapid structural change in an attempt to reverse a decade of economic decline. The new policies, which went under the name "Rogernomics" (after Roger Douglas, New Zealand's Minister of Finance at the time) represented a decisive turn away from state interventionism and an embrace of the free market.[6] Protectionist trade barriers and agricultural subsidies were sharply reduced. Heavily regulated industries, including finance, communications, and transport, were liberalized or deregulated. Many public-sector activities were put on a commercial basis as state-owned enterprises, often followed by privatization.[7]

In the communications sector, the government moved with amazing rapidity from a state-owned Post, Telephone and Telegraph monopoly and a monopolistic public broadcasting corporation to a privatized, deregulated telecommunications industry. On April 1, 1987, the telecommunication business was separated from the New Zealand Post Office, to become a state-owned corporation, Telecom Corporation of New Zealand, Ltd. (Telecom). The telecommunications marketplace was deregulated over the next two years. In June 1990, the government sold Telecom Corporation of New Zealand to two American telephone companies, Ameritech and Bell Atlantic, for [U.S.] $2.4 billion. In 1989, the former state monopoly broadcaster, Broadcasting Corporation of New Zealand (BCNZ) was broken up into an autonomous commercial television company (TVNZ) and a radio broadcasting entity (Radio New Zealand). The passage of the new Radiocommunications Act of 1989 removed most restrictions on entry into broadcasting.

The new Radiocommunications Act thus was passed within the context of the most sweeping revision of economic policy New Zealand had ever seen. The proponents of this wider reform program realized that it was impossible to create a market regime in the telecommunications industry as a whole if one critical factor of production--radio frequencies--was allocated by non-market mechanisms. Spectrum policy had to be reformed in a way that would make allocation and assignment of radio frequencies subject to market forces, and put all telecommunications industry participants on an equal footing with respect to usage and access. The law was not

designed to raise government revenue, nor was price rationing imposed on New Zealand by the kind of acute spectrum scarcity experienced now in the United States.

The NERA Report

In drafting its reform plans, the New Zealand government relied heavily upon the "spectrum economics" literature developed in the U.S. Early in 1988, the Ministry of Commerce (MoC) commissioned Dr. John Fountain of Canterbury University in Christchurch to conduct an extensive review of the spectrum economics literature.[8] The bulk of the review concentrated on the work of "Chicago School" advocates of market-oriented/private-property rights approaches to spectrum allocation.

Apparently convinced of the viability of spectrum management via the market, the Ministry next commissioned a report from the British-American consulting firm National Economic Research Associates (NERA).[9] In the NERA report, the reformers in Wellington asked for and got a blueprint for radical reform of spectrum management along free-market lines. In essence, NERA proposed defining permanent private-property rights to the spectrum, tendering them off to private users, and permitting market exchanges among property owners to do most of the work of allocating frequencies. The reform process was to be concentrated on the bands between 44 MHz and 3.6 GHz. The AM broadcasting band was also included in the reform plans (see spectrum chart).

The Radiocommunications Act of 1989

The NERA report became the basis for the draft of a new law, the Radiocommunications Act of 1989. The Act was passed December 19, 1989, with some modifications. The new law creates two distinct types of spectrum property rights: "management rights" and "license rights."

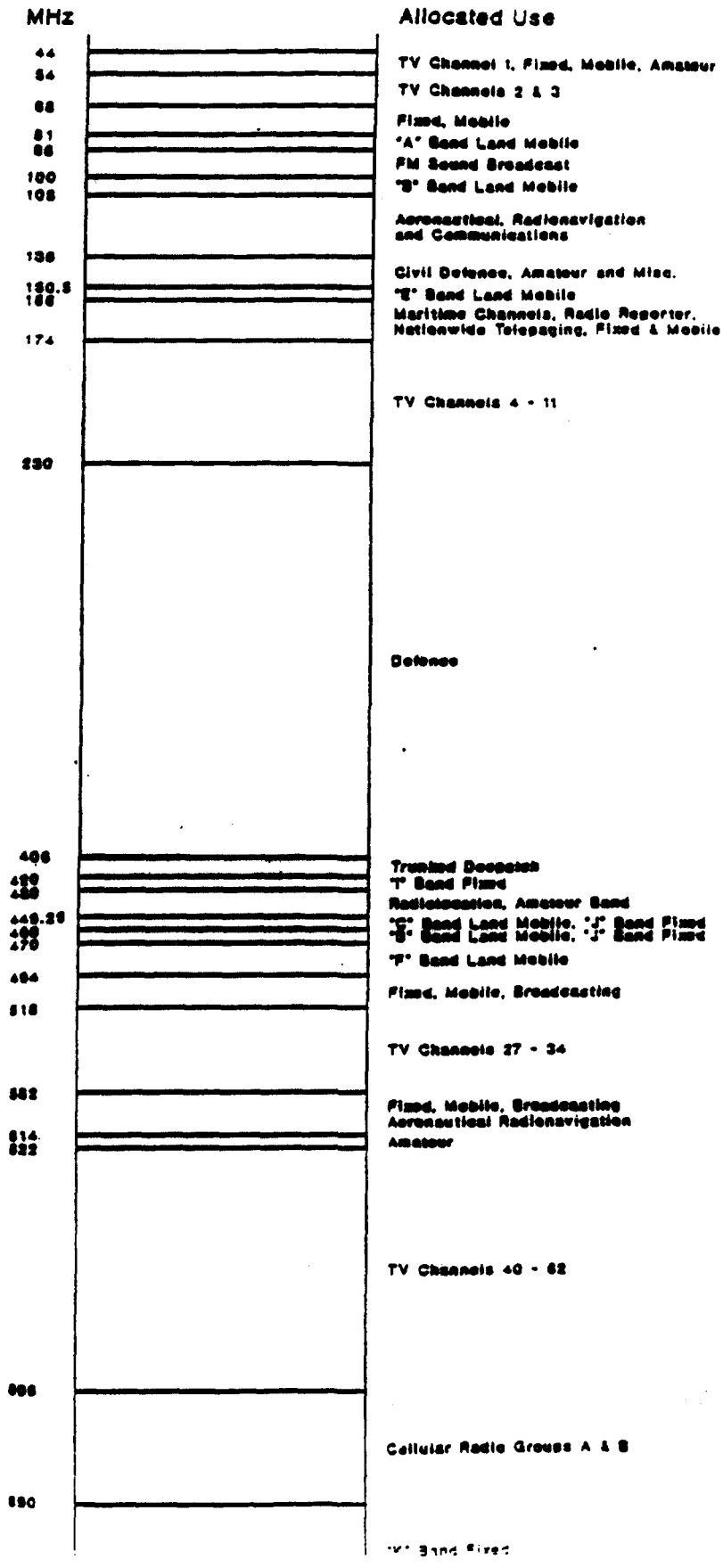
Management Rights

A management right implies ownership of a nationwide band of frequencies for 20 years, and involves the legal right to issue licenses to use frequencies within a specified band (see below for a description of license rights). The nature of management rights is defined in Part IV of the Act.

Management rights:

- are nationwide in scope;
- are tradeable;
- run for a period of 20 years;
- can be subdivided and aggregated under conditions set in Part V of the Act.

THE RADIO SPECTRUM IN NEW ZEALAND -- 44 MHZ TO 900 MHZ



Management rights are recorded in an official registry which specifies:

- A range of frequencies (e.g., 400 - 450 MHz);
- Adjacent-frequency emission limits (AFELs), which restrict the amount of radio energy that the management right holder can spill into other bands. The AFEL specifications must be examined by an approved radio engineer who is willing to certify that they will not interfere with radio navigation services or public-safety radio services, and are compatible with services operated pursuant to existing licenses.
- A protection limit (PL), which protects the management right holder from emissions from other users outside the band. The general or "default" protection limit is -50 dBW (10 microwatts) Equivalent Isotropically Radiated Power (EIRP).

The certification provision was added to the final draft of the law as a kind of safety net in response to criticism from the industry. It was meant to reassure traditional radio engineers that the property rights regime would protect users from forms of interference that are difficult to control or specify.[10]

License Rights

License rights are issued by management right holders to themselves or to other users. They define the specific usage of the band. License rights are similar to existing radio licenses in many ways. They describe the license holder, frequency, power, transmitter site, and class of emission. In addition, there may be other details specified which demarcate the geographic limits of the right and protect holders from interference. License rights differ from traditional radio licenses because:

- they are tradable;
- they are valid for a variable period up to and including the expiry of the management right under which they were issued;
- they contain an interference "guarantee"; i.e., the geographic protection limits function as property boundaries;
- they do not mandate a specific usage, although the interference protection and channelization plan established by the management-right holder generally are drawn up with a specific end-use in mind.

Under the Radiocommunications Act, license rights are subordinate to the management right under which they are issued. Management-right holders can define and issue license rights in any way that does not violate the protection limits of other management-right holders. The management-right owner can lease or auction off license rights on his band, or use them himself.

The Auction Process

The law and the regulations specify an auction process for the initial distribution of management and license rights. Tendering occurs via the following six-stage process:

1. MoC issues a call for expressions of interest in the frequency band under consideration. This is intended to gauge demand for the spectrum and accumulate industry comment on technical issues.

2. Radio Frequency Service (RFS) formulates an engineering plan which defines the rights. This defines the specific AFELs, protection limits, band size, transmission sites, etc., of the rights.

3. Cabinet approval for the tender is obtained, and the management or license rights are created. This involves a formal application from the Secretary of Commerce to the Registrar of Radio Frequencies.

4. A call for tenders is issued. A second-price, sealed-bid tendering method is used. This means that the highest bidder wins the tender, but price paid by the successful bidder is equal to only the second-highest bid.

5. The bids are processed and the results announced. The results are subject to Commerce Commission clearance, on competition policy grounds.

6. The management or license rights are transferred to the successful tenderers.

Incumbent and Noncommercial License Holders

The NERA report recommended making existing license holders tender for their licenses along with all others. The final draft of the law did not follow this recommendation. Instead, existing license holders were allowed to retain their frequencies in exchange for the payment of fees. The law also made special allowances for nonprofit radio users. Public safety, Maori broadcasters,[11] and some noncommercial broadcasters were exempted from the auction process. The exempt users are listed in Schedule 7 of the law.

Experience with Auctions So Far

New Zealand has had four rounds of tendering under the 1989 Radiocommunications Act.

UHF Television Frequencies

The Ministry began with the UHF TV spectrum, which was almost entirely unoccupied. Seven nationwide three-channel lots of license rights and approximately 200 other localized UHF license rights were tendered. (See Table 1)

Cellular Frequencies

Three cellular telephone bands[12] were tendered as management rights between May 18 and June 18, 1990. Telecom New Zealand won the bidding for AMPS-A with a tender of $101 million. The Commerce Commission, however, declined to approve the transaction on competition policy grounds, and the matter is now before the courts and has yet to be resolved. Telecom paid the fee to acquire incumbent rights to the AMPS-B band, but registration of its management rights in that band is being held up while it negotiates with the government over interference protection criteria. Bell South won the TACS A band, and Telecom won TACS B after two higher bids were with-drawn or invalidated. (See Table 2)

Microwave Bands

The 2.3 - 2.396 GHz band (known as "MDS" in New Zealand) was opened for tender July 21, 1990, and closed in September of that year. This spectrum was tendered as 12 lots of eight MHz management rights. Telecom dominated the bidding here, winning eight of the 12 rights. (See Table 3)

AM and FM Broadcasting

A Call for Tenders for the AM and FM radio bands was issued July 26, 1990, amended August 27, 1990, and closed on September 17, 1990. Over 150 license rights were tendered. The new licenses were issued April 3, 1991. (See Table 4)

Table 1

UHF TV Auctions (518-806 MHz)

Dates Held:	Bidding opened: December 21, 1989 Bidding closed: February 12, 1990
(Queenstown:)	Bidding opened: May 18, 1990 Bidding closed: June 18, 1990
Type of Right:	License Rights
Number of License Lots Sold:	85 (7 national, 78 local)
Average Number of Bids Per Lot:	9
Total Number of Bids Received:	760

Winning Bidders On Nationwide UHF Lots

Lot	Winning Bidder	High Bid	Second Bid
1	Sky Network Television	2,371,000	401,000
2	Sky Network Television	2,273,000	401,000
3	Sky Network Television	2,173,000	401,000
4	Broadcast Communications	255,124	200,000
5	Sky Network Television	1,121,000	401,000
6	Totalisator Agency Board	401,000	100,000
7	United Christian Broadcast	685,200	401,000

Table 2

Cellular Tenders

Dates Held:	Bidding opened: May 18, 1990 Bidding closed: June 18, 1990
Type of Right:	Management Rights
Number of License Lots Sold:	3
Average Number of Bids Per Lot:	8
Total Number of Bids Received:	25

AMPS-A

Bidder	Bids (NZ$)
Telecom Corporation of New Zealand	101,200,000
First City Capital	11,158,800
Imagineering Telecommunications	1,388,000
Broadcast Communications Ltd.	2,000
Narberth Investments Ltd.	100
Malbar Systems	12
Laurence Brian Edwards	0

TACS-A

Bidder	Bids (NZ$)
Bell South	85,552,101
Telecom Corporation of New Zealand	25,200,000
Racal-Vodafone Ltd.	1,000,000
Broadcast Communications Ltd.	2,000
Michael Oliver Thaisen	100
Narberth Investments	100
Malbar Systems	12
Imagineering Telecommunications	0
Laurence Brian Edwards	0

Table 2 continued

TACS-B

Bidder	Bids (NZ$)	
Bell South	85,552,101	(X)
OTC International Ltd.	13,250,000	(X)
Telecom Corporation International	7,000,000	
Broadcast Communications Ltd.	5,000	
Michael Oliver Thaisen	300	
Narberth Investments	100	
Malbar Systems	12	
Imagineering Telecommunications	0	
Laurence Brian Edwards	0	

AMPS-B

Incumbent	Incumbent Fee (Est.)
Telecom Corporation of New Zealand	6,000,000

(X) - Bid withdrawn or invalidated

Table 3

MDS (2.3 - 2.396 GHz)

Dates Held:	Bidding opened: July 21, 1990 Bidding closed: September 1990
Type of Right:	8 MHz Management Rights
Number of License Lots Sold:	12
Average Number of Bids Per Lot:	19
Total Number of Bids Received:	235

Lot	Winning Bidder	High Bid	Second Bid
1	Broadcast Communications	$ 307,700	$ 45,000
2	Telecom New Zealand	$ 500,000	$ 107,700
3	Telecom New Zealand	$ 500,000	$ 56,700
4	Telecom New Zealand	$ 400,000	$ 211,000
5	Sky Telecommunications	$ 211,000	$ 51,000
6	Telecom New Zealand	$ 250,000	$ 211,000
7	Multiband TV Ltd.	$ 151,000	$ 45,000
8	Telecom New Zealand	$ 250,000	$ 211,000
9	Multiband TV Ltd.	$ 151,000	$ 45,000
10	Telecom New Zealand	$ 400,000	$ 151,000
11	Telecom New Zealand	$ 400,000	$ 151,000
12	Telecom New Zealand	$ 500,000	$ 101,000

Table 4

AM-FM Radio Broadcasting Auctions

Dates Held:	Bidding opened: July 26, 1990 Bidding closed: September 17, 1990
Type of Right:	License Rights
Number of License Lots Sold:	164 (31 AM, 133 FM)
Average Number of Bids Per Lot:	11
Total Number of Bids Received:	1895

5 Wellington FM Stations

	Winning Bids	Second Bids
Avg:	$ 478,845	$ 116,895
Lowest:	$ 120,111	$ 159
Highest:	$ 821,001	$ 303,030

The Ministry of Commerce will next initiate a call for expressions of interest regarding land mobile bands. There will be another tender to wrap up broadcasting. The fate of the AMPS-A band is still uncertain. If Telecom's bid is eliminated by the High Court, the band may go to the next highest bidder. The government may, however, choose to hold another tender.

Analysis and Summary

New Zealand's new Radiocommunications Act implemented two important experiments in spectrum management. One is the use of auctions or tenders to assign licenses. The other is an attempt to privatize spectrum management through the creation of private-property rights in radio bands. Although both reforms are mutually reinforcing aspects of the government's desire to introduce market forces into telecommunications, they must be kept distinct.

Surface Reform: Auctioning Licenses

New Zealand relied on auctions (more precisely, sealed-bid, second-price tenders) for the initial distribution of spectrum rights. That is, a bidding process replaced tribunals, lotteries, and other administrative mechanisms to decide among competing applicants for a license.

Auctioning licenses does not, by itself, create a market for the spectrum. It privatizations licenses, but the licenses themselves can still be defined and allocated by administrative means. The government can still retain a major role in spectrum management by establishing allocations and standards. From an economic point of view, auctions may be an improvement over alternative methods of handing out valuable rights: the process can be made quicker and less costly to administer; the results tell industry and government something about the real economic value of licenses; the government can realize substantial revenues from the sales. But the use of competitive bidding to distribute channel assignments is not that radical a departure from the status quo. We already know that anything of value can be auctioned, and there is nothing terribly unusual about trafficking in radio licenses. Holders of U.S. broadcast or cellular licenses routinely buy and sell licenses, for example. We thus call this aspect of the law "surface reform."

Deep Reform: Privatization of Spectrum Rights

New Zealand's new Radiocommunications Act also attempted to establish a private market in radio spectrum as an alternative to government control of the spectrum. Privatization of the spectrum has two aspects: a) the definition and distribution of private property rights in a way that protects users from interference but does not compel the use of one technology or the provision of a particular service; and b) allowing transactions between spectrum-property owners to freely enlarge or diminish

service allocations. The object is to allow the marketplace to take over fundamental spectrum management functions, such as planning, channelization, clearance and reallocation of bands, introduction of new services, etc. This is a radical and unprecedented step. It involves the privatization and commercialization of activities that have been performed almost exclusively by governments since the origins of radio communication. It also may involve a departure from the block allocation methods that are the traditional basis of radio engineering (although this is not necessarily the case). This aspect of the law we refer to as "deep reform."

As noted before, surface reform and deep reform are distinct and must be evaluated separately. Either reform could be introduced independently of the other. The results of the two experiments have significantly different implications for the future of spectrum management in the United States. Thus, in Parts III and IV of the report, the results of the tenders and the results of "deep" privatization are evaluated separately.

III. Auctions as an Assignment Procedure

The advocates of auctions as an assignment method make four claims. First, auctions reduce the time and money spent by the government to assign frequencies because they discourage frivolous or speculative applications. Second, they increase the efficiency and effectiveness of the assignment process by ensuring that licenses are only granted to those who value the spectrum more than other applicants. Third, requiring licensees to pay a market price for the spectrum encourages efficient use by licensees. Fourth, the revenue gained from the auctions fairly compensates taxpayers for the use of a scarce resource. The opponents of auctions rely on essentially one argument: bidding for the spectrum will exclude all but the richest applicants. The resource will become concentrated in the hands of a few of the largest interests. Small users and experimental start-ups will be shut out of the process. The experience with spectrum tenders in New Zealand tests the validity of each of these claims.

On the whole, auctioning licenses has been the most successful and least problematic aspect of the New Zealand experiment. After four rounds of tendering, one will find almost no complaints in New Zealand about the principle of distributing license or management rights by tender in cases when there are more applicants than licenses. The idea is welcomed by businesses as an improvement over administrative methods. It is also accepted as fair and reasonable by noncommercial participants such as amateurs and community broadcasters, provided that certain reservations are made. The successes of tendering can be summarized in the following points:

i) Applicants were enabled to enter desired telecommunications markets expeditiously.

ii) Smaller applicants were not excluded.

iii) Some tenders successfully rationed between competing uses as well as users.

iv) The process revealed the value of the spectrum in various locations and applications.

v) The government received a significant amount of revenue for spectrum (but could have received much more).

Although the overall experience with tenders has been positive, some problems were encountered during the tendering process. These were:

i) In some cases the small number of bidders led to anomalies in the prices bid and paid for licenses.

ii) The dominance of Telecom New Zealand in the overall marketplace did raise competition policy concerns. Antitrust safeguards superimposed an administrative review over the results of the tender, leading to delay and litigation.

For the most part, these problems were caused by the small size of New Zealand's telecommunications marketplace and have little bearing on the viability of an auction process in the U.S.

III. The Success of Spectrum Auctions

More Efficient Assignments

Tendering proved to be an expeditious way of resolving competition for assignments. The Ministry of Commerce issued its invitation for expressions of interest in the UHF band in April 1989. The type of licenses to be sold (i.e., a channelization plan) was worked out during the summer, and the final call for tenders was issued in late December 1989. Bidding was closed on February 12, 1990, and a provisional list of successful tenderers was published ten days later. Three months later, Sky Network TV was using three of the nationwide channels in its pay TV service. The time from the call for expressions of interest to actual usage of the UHF band was only one year. It was only two months between the time that over 200 UHF channels were made available and the time all competing applications for them had been resolved. With one exception, all of the other spectrum tenders also took two months or less to assign licenses.[13]

This makes for an interesting contrast with U.S. attempts to assign licenses to unused channels. Both the FCC's low power television and cellular telephone proceedings were overwhelmed by the large number of applicants. In the 220 MHz band the FCC received over 100,000 applications in a matter of days, forcing the commission to suspend taking applications. In each of these cases the FCC's administrative assignment methods broke down because private users had absolutely nothing to lose (and a valuable resource to gain) by applying for a license. The glut of applications led to long delays in the use of the bands as the FCC attempted to use arbitrary or time-consuming methods such as lotteries or comparative hearings to resolve the competing claims. The auctioning method allowed New Zealand to completely avoid such debilitating overloads of the assignment system.

The results of the UHF tender also compare favorably to New Zealand's own assignment methods prior to the passage of the new Radiocommunications Act. It took New Zealand several years to make a decision to permit a new, nationwide commercial VHF television network (TV3). After the government decided to authorize a new TV network, the applicants had to go through two years of expensive administrative proceedings before one company was awarded the necessary licenses. These expenses had to be incurred regardless of whether the applicants were successful or not. In administrative proceedings, unlike auctions, both winners and losers must pay for access to the spectrum. For smaller, less wealthy or less powerful applicants, this represents a substantial barrier to entry. These barriers were eliminated by the auction procedure.

Smaller Entrants Not Excluded

In both the AM-FM radio and the UHF TV bands, the tendering process made it possible for many new service providers to enter the market. Applicants representing a broad range of institutions and individuals, commanding both very large and very small amounts of money, successfully gained access to broadcast channels. Outside of the three large urban areas, where the bidding was dominated by larger commercial organizations, winners of FM radio channels include the Wairoa Baptist Church, local newspapers, an organization called Injection Moulders Ltd., and many unaffiliated individuals. In one case a student from Dunedin won a local UHF channel in a small city on the South Island by bidding $1 and paying $0. He later sold the channel to Southland Communications Ltd. for NZ$12,600. Not all of the commercial broadcasters who won channels will survive in New Zealand's small and increasingly competitive market for advertising revenues. But entry is essentially deregulated.

One of the new entrants was the Totalisator Agency Board (TAB), a pari-mutuel organization owned by New Zealand's horse racing clubs. TAB won one nationwide UHF TV lot and many FM radio licenses. TAB began using its FM acquisitions in April to network the signal of an Auckland station that carries horse racing. TAB is

currently studying the costs of establishing a nationwide TV broadcast of horse races. In the meantime, it will lease its spare capacity to community and educational TV groups.

The participation of TAB is just one example of how auctioning assignments actually increases smaller and less powerful groups' access to spectrum. TAB's willingness to lease underscores another advantage of the flexibility of license rights. Even when smaller, community-oriented broadcasters were unable to win tenders, the free transferability of rights allows them to gain access to the spectrum in other ways.

The large amount of unoccupied spectrum in New Zealand made it easier for many diverse bidders to tender successfully. In the broadcast spectrum, the tender was held at a time when the total supply of channels exceeded the number of bidders capable of sustaining broadcast and programming operations.

Rationing Uses as Well as Users

The MDS (2.3 - 2.396 GHz) tender was particularly interesting from an economic viewpoint, because the bidding rationed uses as well as users. During the expressions of interest stage, the Ministry of Commerce received conflicting proposals. Some thought the band should be used for broadband transmission links, others thought it should be used for pay TV to the public. The "linkers" were represented by BCL and Telecom Corporation of New Zealand. The "broadcasters" were represented by Sky and Multiband Television Ltd. BCL proposed a channelization scheme of 28-MHz management rights. The broadcasters favored 8-MHz management rights. BCL was also concerned that the channelization plan establish a guardband on the 2.3 GHz side to protect its existing licenses on the lower adjacent band.

In the end, the government's call for tenders favored the broadcasters over the linkers, offering twelve lots of 8 MHz management rights (8-MHz corresponds to the size of a single television channel in New Zealand). The results of the tender, however, showed that the linkers' demand was stronger. Telecom acquired eight of the 12 lots, Sky won only one lot, and Multiband Television won only two. In addition, BCL successfully tendered for the 2.3 - 2.308 GHz channel in order to establish a guardband as it desired. Thus, the tender allowed three different, potentially conflicting conceptions of how the band should be used to be resolved through the market process. The fact that management rights were tendered adds to the flexibility of the results: in the future, the 8-MHz channels can be aggregated or subdivided by their owners or through further transactions to suit different service demands.

The MDS auction demonstrated that applicants who can exert a strong influence over allocation criteria through hearings and lobbying may not be those who value the frequencies the most. Auctions have the virtue of granting licenses to those applicants

who can demonstrate the greatest desire or highest value on their proposed use. The richest bidders did not acquire all of the frequencies available, however; market rationing made it possible for smaller contestants with incompatible ideas about usage to "win" as well.

Although the MDS band has not yet been put into service, it represents the purest example of market allocation of radio frequencies at work, and thus bears watching in the future.

Public Compensation

A significant amount of revenue was generated from the tendering of radio frequencies. The AM-FM tenders brought in a total of NZ$4.775 million. The UHF TV tenders' second-price totals equalled NZ$2.9 million. The cellular tenders raised either NZ $26.593 million or 36.364 million, depending on the outcome of the court appeal. The MDS tenders' second-price totals summed to NZ$1.598 million. The grand total will fall somewhere between NZ$36 - 46 million. (The New Zealand dollar is worth about 0.6 of the U.S. dollar.)

These totals fell short of projections. The NERA Report projected that the cellular frequencies alone would be worth NZ$240 million. NERA also forecast that the government would receive $5-10 million for 10-20 FM license and management rights (in fact, 128 FM license rights were tendered). NERA's wrong guesses, however, only underscore the truism that even economists cannot know the value of a resource without a price system.

As noted earlier, revenue generation was not a primary goal of the 1989 Radiocommunications Act. Had the government desired to do so, the tenders could have been organized to generate more revenue; for example, reserve prices could have been set, and the supply of spectrum released to the public could have been more restricted.

Problems with the Auctioning Process

Although the overall experience with tenders has been positive, there were problems encountered during the tendering process. There were many anomalies in the prices bid and paid for licenses. And in one case (cellular), competition policy superimposed an administrative review over the results of the tender, leading to delay and litigation.

The Second-Price Method

The most common target of criticism is the second-price tendering system, the anomalous results of which sometimes engendered scorn or bewilderment. In many cases there was a huge disparity between the first and second bid prices. Table 5

shows the most extreme cases, but it was not uncommon for the first and second bids to differ by a factor of ten. In other cases there were wild variations between the prices paid for radio bands that were roughly equivalent. The most glaring example is the tender for TACS cellular bands. Bell South paid NZ$25.2 million for TACS A; TACS B went to Telecom Cellular for NZ$5,000.

The disparities between the first and second bids are not a serious flaw. Many critics have assumed that a bidder's revelation of his willingness to pay, say, $2.3 million for a UHF TV channel somehow means that the government should have received $2.3 million. Such a view misses the point of the second-price method. In any form of auction, the winner only pays enough to beat his closest competitor. With the second-price method, bidders are encouraged to calculate and reveal the resource's real value to them, safe in the knowledge that ultimately they will only have to pay the second-best price. This encourages rational economic calculation, and the information that is obtained about the variance in value can be useful.

The variation between the prices for equivalent bands is more troubling. This seems to have been a function of the thinness of the market. In most cases there were only two or three major bidders, followed by a pack of small bidders. The tendering rules allowed companies which wanted only one license to bid for several in case they failed to enter the highest bid for the one they wanted. In such cases the bidders formally expressed a preference, and if they won the preferred license their other bids were withdrawn. In some cases the withdrawal of one and sometimes two of the major bidders left very small first and second prices.

Table 5

First and Second-Bid Disparities

Type of License	First and Second Bids
UHF TV channel, Christchurch area	$ 100,004
	$ 6
UHF TV channel, North Island	$ 107,000
	$ 2,000
FM radio channel, South Island	$ 35,070
	$ 159
FM radio channel, Wellington area	$ 550,111
	$ 159
TACS-B cellular management right	$ 7,000,000
	$ 5,000

Table 6

Disparities Across Comparable Bands

Band		Purchase Price
TACS A:	NZ$	25,200,200
TACS B:	NZ$	5,000
FM 112AAB:	NZ$	303,030
FM 111AAA:	NZ$	159

The real cause of the price disparities within and across tenders was the thinness of the New Zealand market. All auction methods require a large number of buyers in competition before they work properly. The variability revealed by the second-price method reflected the surplus in the number of licenses available relative to the number of serious bidders. This was indicative of a failing, not of the second-price method, but of the MoC to act like a profit-motivated spectrum manager. MoC released too much spectrum at once and failed to set a reserve price. It did not maximize the value of its management rights by controlling the release of licenses more carefully. This may or may not have been a bad thing. If the object of the tenders was to maximize government revenue, MoC blew it. If the object was to transfer to the private sector as many license rights as possible as quickly as possible in order to lay the groundwork for a private market, the MoC did an extraordinary job.

Competition Policy

At $101 million, Telecom New Zealand was far and away the highest bidder for the AMPS-A band. Telecom Cellular already occupies the only other AMPS (Advanced Mobile Phone Service) band, AMPS B, where its incumbent cellular service is located. Under New Zealand law, acquisitions of radio spectrum are subject to the merger/takeover provisions of the Commerce Act, and must be cleared by the Commerce Commission. The Commerce Commission instantly declined to approve Telecom's purchase of AMPS A, reasoning that it would be anticompetitive.[14] Telecom has appealed the decision to New Zealand's High Court, where it is pending.

The Commerce Commission reasoned that if Telecom Cellular controls both AMPS bands, new competition in the cellular market will be restricted to the TACS bands. If new competitors are restricted to the TACS bands, then customers cannot use their existing cellular phones on competing systems. It could also take two years for a widely accepted technical standard for the use of TACS bands to emerge. Telecom control of AMPS-A would thus defer competition for a significant period and weaken it when it arrived.

Telecom rejoins that the results show the Commerce Commission review of the tender to be a "beauty parade" very much like the old Broadcasting Tribunal. It also contends that the willingness of Bell South to pay NZ$25 million for the TACS-A band indicates that TACS-based competition in the cellular arena is viable.

Thus, a lengthy administrative and judicial process has been superimposed over the tender results, tying up the band for many months. More importantly, the cellular tender indicates that there are limits on the ability of a spectrum market to make radio communications markets open and competitive. The installed base of AMPS telephones makes AMPS frequencies far more valuable than TACS bands at this

time. However, additional frequencies cannot be reallocated to AMPS cellular use because the cellular telephones available do not work in any other band. Small countries like New Zealand will not motivate manufacturers to redesign their equipment. Of course, the same constraint would exist in an administrative system of spectrum management.

Given the constraints of equipment standards and the presence of large, still-dominant former monopolies (a situation which prevails nearly everywhere in the world), competition or "antitrust" considerations must be introduced. If one is not careful, however, competition policy can become the entering wedge of the same slow and politicized administrative decision-making procedures that spectrum auctions were intended to avoid in the first place.

IV. Experience with Spectrum Property Rights

Earlier on, a distinction was made between "surface" reform and "deep" reform of spectrum management. An example of the former is spectrum auctions, in which market rationing is introduced to license distribution only; the latter refers to the outright privatization of the spectrum and subsequent reliance on market transactions to perform most spectrum allocation functions.

Thus far, most public reports on New Zealand's new law have focused on the auction results, i.e., on surface reform. The real test of New Zealand's experiment, however, will hinge on the success or failure of deep reform. New Zealand's attempt to create tradeable and fungible property rights in radio channels is the most interesting and significant part of its new Radiocommunications Law. If the spectrum can be successfully privatized and the market can take over the task of allocating this increasingly vital resource, then many other countries will want to emulate New Zealand's reforms. If the results are not successful, then the whole rationale of the new law is called into question, and the introduction of market forces into spectrum management will have to take a different form.

On this front the results are still uncertain. A variety of political and institutional pressures have stalled and mitigated the process of deep reform. Gradually and almost unconsciously, the law's implementation has diminished the scope of spectrum privatization, at least for the time being. This is not surprising, given the radical nature of spectrum privatization. Sweeping changes in a society's property structure are not made easily and do not occur overnight, as many vested interests are involved. Nevertheless, two important conclusions can still be drawn about the prospects for deep reform in other countries. These are:

i) Private-property rights to the spectrum are technically feasible; the biggest problems encountered in implementing them are political and institutional.